REMARKS

Claims 1 and 3-22 are pending. Claim 2 has been canceled, and the requirements of claim 2 were incorporated into claim 1. Claims 6, 7, 14, 19, and 20 were amended for clarity as suggested by the Examiner. New claim 22 was added; this claim is supported by disclosure at page 8, line 26, of the specification.

No new matter has been added by this amendment

35 U.S.C. § 102

Claims 1, 3-18, and 21 were rejected for anticipation by Foley et al. Foley et al. describe a mask device that covers both nostrils of a horse (see disclosure throughout the reference and Figs. 1-2). Claim 1 has been amended to incorporate the requirements of dependent claim 2. Amended claim 1 now requires that the device does not enclose a second external nare of a mammal. Claims 3-18 and 21 depend either directly or indirectly from claim 1. Therefore, the amended claims are not anticipated by Foley et al.

35 U.S.C. § 103

Claims 2, 19, and 20 were rejected for obviousness over Foley et al.

With respect to claim 2, the Examiner states:

> Foley teaches essentially all of the limitations except for wherein the device does not enclose a second nare of the mammal. However, the device would function equally as well with respect to delivering the drug regardless of the device enclosing or not enclosing the second nare. Furthermore, Applicant has not stated how the particular limitation solves a stated problem or is advantageous over the prior art of record. It would also be obvious to one of ordinary skill in the art to modify the device so that it does not enclose the second nare. (page 5, lines 15-21, of the Office Action)

Claim 2 was canceled and the claim limitation "wherein the device does not enclose a second nare of the mammal" was incorporated into claim 1. All of the claims now require that the drug delivery device of the invention does not enclose a second nare. The Examiner correctly noted that Foley et al. do not teach a device that encloses one but not a second nare of a mammal. Since Foley fails to describe an essential limitation of the claims and since the Examiner cited no additional prior art that does teach a device that encloses only one nare, there is no basis for an obviousness rejection.

The Examiner stated that "the device would function equally as well with respect to delivering the drug regardless of the device enclosing or not enclosing the second nare" but has pointed to no disclosure or evidence in the prior art that would suggest so. In fact, the claimed device is fundamentally different from Foley's device, and Applicant submits that the claimed device functions better than the prior art device. The specification of the present application specifically points out limitations of prior devices such as that of Foley et al. and details the advantageous features of the claimed device.

Numerous advantages of the claimed device are disclosed on page 3, line 12, to page 4, line 6, of the specification. For example, the device provides improved delivery of therapeutic compositions to small airways of the lung. Increased lung deposition is achieved by (1) minimizing nasal impaction, and (2) maintaining small particle size. The single nare design, which allows exhalation of air through the uncovered nostril, is fundamental to the improved drug delivery performance of the claimed device. Other advantages include increased patient acceptance (due to minimal invasiveness), compactness (small size allows ease of packing, e.g., on trail rides and in other situations in which storage space is limited), and lower cost of manufacturing due to simple design.

The Foley device alters the subject's breathing pattern and leads to nasal impaction of aerosolized particles. Foley et al. describe a mask, which covers both nostrils, and in some cases, the mouth of the animal: "the provision of a mask which is readily attached over the nostrils and mouth of an equine animal, which mask has a provision for causing the animal to gasp, and thereby draw in more medication" (col. 2, lines 12-16 of Foley et al.; emphasis added). The reference further states that "[t]he mask should create come (sic) resistance to breathing for the horse, as this tends to open the airways, allowing for a more effective use of the medication." (col 11, lines 21-24, of Foley et al.; emphasis added). In contrast, the claimed device does not provoke a change in breathing patterns of the treated animal, because only one nare is covered. Maintaining normal breathing patterns in the treated subject is a distinct advantage of the claimed invention, because it reduces nasal impaction and allows aerosolized particles to gain access to the lung.

Higher air velocities (such as flow rates associated with a gasp) increase nasal impaction and lead to loss of drug to upper airways rather than deposition of drug in the lung (see, e.g., page 127, lines 27-29, of Mechanisms of particle deposition and clearance in Aerosols in Medicine, Principles, Diagnosis and Therapy, Morin et al., eds., 1993, Elsevier Press; Exhibit A). Gasping can also lead to air turbulence in a mask (such as that described by Foley), which contributes to loss of drug. By promoting natural breathing, the claimed device promotes increased deposition of drug in the lung. For example, at page 7, lines 10-20, the specification teaches:

> Mask devices are often not well-tolerated by animals. With a mask-type device, a horse typically alters its breathing to take short breaths. The device described herein does not provoke a change in breathing patterns of the treated animal. The advantages of an

> external nasal delivery device is small size, versatility of angles of drug delivery, and better tolerance (i.e., less irritation) by the treated animal. Drug delivery by the device of the invention is more efficient than mask-type devices because the flow of drug is directly from the drug container and into the airways of the animal. In contrast, drug administered via a mask-type device must flow around the nostrils to get into the air passage of the nostril, thus reducing the amount of drug effectively administered to the animal.

The claimed device maintains a small particle size of drug by avoiding exposure of the particles to exhaled (humid) air. The size of aerosolized particles increases when exposed to water vapor (see, e.g., page 125, lines 16-18, of Morin et al.; Exhibit A). As the particles grow in size, they sediment in more proximal (larger) airways rather than being deposited in the smaller airways of the lung. The Foley device covers both nostrils, a configuration that leads to rebreathing of expired air and humidification of air in the mask. At page 3, lines 3-5, the specification teaches:

> devices which cover the nose and/or mouth of an animal with a mask or rebreathing chamber result in condensation and clumping of particles. The resulting particles are too large to gain access to small airways

On page 8, lines 21-27, the specification further addresses the drawbacks of devices like Foley's:

> Some devices also contain a rebreathing chamber and/or an inlet valve for fresh air. Exhalation into the same chamber into which drug is initially delivered causes the drug particles to condense, i.e., become larger, further decreasing the efficiency of drug delivery to the lung and small airways of the animal. Repeated inhalation/exhalation cycles further decrease the efficiency of drug delivery. The device of the invention lacks a rebreathing chamber and delivers small particles of drug in a single effective dose in a single breath inhalation.

With respect to claims 19 and 20, the Examiner states:

> Foley fails to specifically teach the limitations with respect to the particle size. However, such limitation depends on the intended user along with the intended therapy and the type

of medicament used along. Furthermore, such a limitation may be arrived through routine experimentation and observation.

The claimed methods require contacting one nare of a mammal with a device that covers one but not a second external nare to deliver a therapeutic composition in a single inhaled breath. In contrast, Foley et al. describe adminstration of medication over 5-10 minutes, during which time the animal is continuously breathing and rebreathing into the mask chamber covering both nostrils (see col. 11, lines 30-45, of Foley et al.). Thus, Foley specifically teaches a prolonged delivery method, i.e., over several inhalations, rather than the claimed single inhalation method.

The claimed methods maintain aerosolized particles in a small size. Minimizing particle size is an important advantage of the claimed methods, because large particles become impacted in the nose and fail to gain access to the lung.

The claims require that the size of aerosolized particles does not exceed 10 microns (claim 19) and is in the range of 3-5 microns (claim 20). As was discussed above, the claimed device avoids exposure of the therapeutic composition to exhaled air, because it encloses only one nare allowing the animal to exhale with the uncovered nostril or nare (page 7, lines 20-21, of the specification). In contrast to the claimed device, the particles in Foley's device must traverse through a water saturated environment (i.e., exhaled air) leading to hygroscopic growth of particles. As is well known in the art "particles larger than 10 μm are completely trapped in the nose" (page 127, line 36, of Morin et al.; Exhibit A).

The requirements of claims 19 and 20 are neither disclosed nor suggested by the prior art. Moreover, given the mask structure and rebreathing chamber described by Foley et al., one of

skill in the art would not expect the Foley device or method to preserve a particle size of 10 microns or less.

In the absence of any suggestion whatsoever in the art to make a device that covers only one nostril of an animal and the numerous advantages of the claimed invention over the devices/methods of the prior art, Applicant submits that the present rejection should be withdrawn.

35 U.S.C. § 112, second paragraph

Claims 14, 19, and 20 were rejected for indefiniteness. The claims were amended to meet the rejection. Claim 14 was amended to require that a lumen of the drug delivery device is adapted to receive a metered-dose inhaler cannister. Claims 19 and 20 were amended to correct antecedent basis.

35 U.S.C. § 101

Claims 6 and 7 were rejected for allegedly claiming non-statutory subject matter. The claims were amended as suggested by the Examiner. This rejection can now be withdrawn.

CONCLUSION

On the basis of the foregoing amendments and remarks, Applicant respectfully submits that the pending claims are in condition for allowance.

Applicant files concurrently herewith a petition for a two (3) month extension of time, together with a check for $460.00 to cover the fee pursuant to 37 C.F.R. § 1.17(a)(3). With the extension, this amendment is due on or before August 28, 2002. The Commissioner is hereby authorized to charge any required fees, or credit any overpayment, to Deposit Account No. 50-0311 (Reference No. 21629-001).

Respectfully submitted,

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APPENDIX:
MARKED-UP VERSION OF AMENDED CLAIMS

In the claims:

1. (amended) A drug delivery device for a mammal comprising a cup-shaped body for enclosing one external nare, wherein said device does not extend into the nostril of said mammal and wherein said device does not enclose a second external nare of said mammal.

6. (amended) The device of claim 1, wherein said [mammal is selected from the group consisting of] device is adapted for use on a horse, a cow, a sheep, [and] or a goat.

7. (amended) The device of claim 1, wherein said [mammal is] device is adapted for use on a horse.

14. (amended) The device of claim [13], wherein said lumen is adapted to receive a metered-dose inhaler (MDI) cannister.

19. (amended) The method of claim 18, wherein [the size of] said particles [does] do not exceed 10 microns in size.

20. (amended) The method of claim 18, wherein [the size of] said particles [is] are in the size range of 3-5 microns.

Add new claim 22.

--22. (new) The device of claim 1, wherein said device lacks a rebreathing chamber.--